

**WHAT IS CLAIMED IS:**

1. A method of designing a communication architecture comprising:
  - a) receiving a partitioned system, communication architecture topology, input traces and performance matrices;
  - b) analyzing and creating communication analysis graph (CAG);
  - 5 c) partitioning communication instances to create partition clusters;
  - d) evaluating cluster statistics related to the partition clusters and assigning parameter values to the partition clusters to form a new system with new communication architecture;
  - e) reanalyzing the new system and recomputing performance metrics;
  - 10 f) if performance is improved then synthesizing CATs to realize optimized protocols; and
  - g) if performance is not improved then returning to step c;
2. The method of claim 1 wherein step c further comprises:
  - (c) (i) analyzing the CAG to measure impact of individual communication instance delays on system performance;
  - (c)(ii) measuring performance impact of an instance using
  - 5 sensitivity; and

(c)(iii) grouping instances having a similar impact on system performance into a same partition.

3. The method of claim 2 wherein said sensitivity of the system performance to a communication instance is measured as follows:

perturbing an existing delay of the communication instance by a value;

5 traversing a transition fanout of the communication instance in the CAG;

recomputing a start and finish time of affected vertices; and

calculating changes in the system performance using recomputed finish times.

4. The method of claim 1 wherein step d is accomplished by deriving a metric that penalizes a partition having a negative impact on delays of communication events in other partitions;

5. The method of claim 4 wherein said metric is calculated as follows:

analyzing the CAG and evaluating for each partition pair  $CP_i CP_j$  an amount of time for which communication events that belong to  $CP_i$  are delayed due to events from  $CP_j$  to form delay statistics ; and

